TECHNICAL SUPPORT FOR EVALUATION OF BUFFER STRIPS ON THE MADE IN DETROIT DEVELOPMENT PROJECT, U.S. ARMY ENGINEER DISTRICT, DETROIT

Report Prepared for the U.S. Army Engineer District, Detroit

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OBJECTIVES

The objective of this effort is to assist the U.S. Army Engineer District, Detroit in assessing the importance and effectiveness of existing buffer strips to provide wildlife habitat and protect water quality in a sensitive wetland complex associated with a proposed housing development by Made in Detroit, and to provide recommendations for enhancement of those functions.

SITE DESCRIPTIONS AND ASSESSMENT

Dr. Richard A. Fischer and Mr. Chester O. Martin, Research Wildlife Biologists (herein the WES team), Waterways Experiment Station (WES), provided an on-site assessment of buffer strips associated with Humbug Marsh on 3 August 1999 with the assistance of personnel from the Detroit District. This report provides an assessment of natural resources associated with buffer strips of the Humbug Marsh complex. We also provide recommendations based on the scientific literature and the best professional judgement of the WES Team.

Humbug Island

During the morning, WES team members met with Mr. David Gesl and Ms. Melissa McPherson, Regulatory Branch, Detroit District. We were ferried upstream by boat on the Detroit River to Humbug Island. We walked the length of the island, viewing both the interior and shoreline areas as well as the Humbug Marsh complex. The western shore overlooks Humbug Marsh and provides an unobstructed view of the marsh and mainland portions of the proposed development. This shoreline is a transitional zone between the island's forest and the open marsh. Humbug Island has an unfragmented hardwood overstory comprised of a variety of oaks (*Quercus* spp.), hickories (*Carya* spp.), and other hardwood species, with a well-developed midstory and thick leaf-litter/detritus layer. Habitats were diverse and heterogeneous, with numerous snags (i.e., dead and dying trees) and downed trees that contributed to the value of the island for wildlife. The eastern shoreline is more beachlike with some areas having steep drop-offs with exposed sandy faces.

Birds. Based on habitat characteristics of Humbug Island, we suggest that the island likely serves as high-quality habitat for resident and migratory birds. The Detroit River provides habitat for at least 17 species of raptors and 48 species of non-raptors (Manny et al. 1988). The Rouge River Bird Observatory, University of Michigan-Dearborn, sponsors a spring migration count of birds in Wayne County, Michigan. Since 1995, a mean of 127 species of birds have been documented in Wayne County during early May. Belle Isle is included in the survey protocol. Point Pelee, a Canadian National Park approximately 25 miles due East of Humbug Island, is often dubbed the


Figure 1. Humbug Island

"Warbler Capital of North America" because tremendous numbers of Neotropical migrant landbirds and other birds stop to rest and replenish energy reserves during long-distance migrations in both Spring and Fall. It is very likely that a large number of birds also migrate along the Detroit River and stop-over in suitable habitat such as that found on Humbug Island. Due to the linear nature of the island, and the unfragmented overstory and midstory layers, any development on the island will substantially reduce or eliminate habitat for both resident and migratory birds.

Numerous memoranda to the Detroit District from various sources cite the importance of the proposed development area to a variety of avian species. The open water area between Humbug Island and the mainland serves as habitat for a variety of waterfowl, wading birds, and shorebirds (Michigan Department of Environmental Quality 1989, USFWS 1998). The Detroit River, as well as many navigation pools of the Upper Mississippi River, are significant staging areas for canvasbacks (*Aythya valisineria*) and wintering/staging habitat for other waterfowl species (Dennis and Chandler 1974, Jones 1981, Dahlgren and Korschgen 1992). Disturbance to waterfowl can result from human presence, traffic, fishing, boating, and other human activities (Dahlgren and Korschgen 1992) which can lead to lowered use by waterfowl in disturbed areas (Dennis and Chandler 1974).

Figure 2. The proposed development area commonly referred to as Humbug Marsh and Humbug Island.

Figure 3. Humbug Island and surrounding waters provides important feeding and resting habitat for a variety of waterfowl.

Any development on the island and the mainland adjacent to the marsh will provide a source of disturbance[1] to wintering and migrating waterfowl in the marsh, as well as wading birds and other waterbirds using the wetland and fringe habitats along the shorelines. Potential problems associated with disturbance include displacement from feeding grounds, energetic costs associated with flight, and lowered reproductive output to nesting and brooding waterfowl (Korschgen et al. 1985, Belanger and Bedard 1990, Dahlgren and Korschgen 1992). If development occurs adjacent to the marsh and on the island, many species of waterfowl may no longer use the marsh.

Humbug Island is used for perching by both bald eagles and osprey, wading birds such as Great Egret (*Casmerodius albus*), Great Blue Heron (*Ardea herodias*), and Black-crowned Night-Heron (*Nycticorax nycticorax*) (Michigan Department of Environmental Quality 1989, Michigan Department of Natural Resources 1999), shorebirds, and a variety of migrant and resident songbirds (USFWS 1998, Detroit Audubon Society

[1] Dahlgren and Korschgen (1992) consider human disturbance to waterfowl as "a direct event, intentionally or unintentionally created by people, leading to a reaction of alertness; fright (obvious or inapparent); interruption of activities; flight, swimming, or other displacements; or death or disablement. The event may have long-term or short-term effects."

1999). Buffer strips provide resting, perching, feeding, breeding, and hiding cover and are critical habitat components for many of these species.

Fisheries. The Humbug Marsh complex has been well documented to be extremely important as fish habitat. The area is recognized as a significant spawning and nursery area for forage fishes and contributes to a regionally important walleye fishery. The lower Detroit River, including Humbug Marsh, is considered the most important spawning and nursery habitat in the entire Detroit River and much of western Lake Erie (Manny et al. 1988). More than 45 species of fish spawn in this area, including forage fish like emerald and spottail shiners, sport fish such as northern pike, bass, and muskies, and commercial species such as yellow perch and channel catfish. Several recent sample surveys conducted by the Michigan Department of Natural Resources (1997, 1998) have revealed heavy use of the Humbug Marsh system by numerous species of game and forage fish. For example, during one day of sampling in 1996, 24 species of fish were collected from this area (U.S. Environmental Protection Agency 1998).

Any additional development in the area is likely to have a detrimental impact on fishery resources, especially if an adequate vegetated buffer is not established to protect aquatic and wetland areas from erosion and nonpoint source pollution. Removal of native trees and shrubs and conversion of these sites to manicured lawns will potentially introduce increased amounts of nutrients (through fertilizer application), herbicides, and pesticides into the system. These chemical changes can result in significant alterations to existing wetland and aquatic plant communities and can deplete invertebrate food resources that are critical to the food chain and some life stages of predatory game species. Development on the island could be especially detrimental to fisheries because of the relatively narrow wetland fringe that buffers aquatic areas from the adjacent upland.

Mainland

During the afternoon, we walked through two separate areas on the mainland portion of the proposed development. The first area was within and adjacent to the lower conservation easement near the southeastern corner of the proposed development. The second area began at the northwestern corner of the proposed development and proceeded southeast along the conservation easement adjacent to the marsh.

It was apparent that vegetation had been removed to ground level from the majority of the conservation easement. According to Mr. David Gesl (U.S. Army Corps of Engineers, Detroit District, Personal Communication), trees up to and including 6 inches diameter at breast height were removed by "bushhogging" during early December 1998. Close observation indicated that trees were removed within a few inches of the ground, creating soil disturbance and bare soil around stumps. Numerous brushpiles were observed in the uplands that likely were the result of trees and associated slash from the bushhogging operation. The easement has begun to revegetate during the 1999 growing season. A silt fence was established along the wetland boundary after vegetation was removed from the easement. No significant buildup of sediment was noted on the upland side of the fence.

Figure 4. Vegetation was almost completely removed from the 60-ft. -wide conservation easement.

The conservation easement states that, "the purpose of the easement is to maintain the Easement Premises in their natural and undeveloped condition." In our opinion, removal of vegetation by bushhogging has not left the easement in a natural state. Direct removal of woody and herbaceous vegetation has resulted in the modification of wildlife habitat along approximately 2100 ft. of the conservation easement (David Gesl, U.S. Army Corps of Engineers, Detroit District, Personal Communication, 1999), which substantially reduced available breeding and nesting habitat for numerous songbirds, raptors, mammals, and probably some species of reptiles and amphibians. Habitat will be lost to forest nesting birds for a period of approximately 20 years. The removal of trees within the easement has lengthened the time it will take for snags to develop within the buffer strip. Snags are of particular importance to bald eagles and osprey, which have been reported resting on the island and mainland and feeding in adjacent waters. Vegetation removal may also have severely compromised the ability of the buffer strip to protect wetland and aquatic habitats from sedimentation and other potential non-point source pollutants found on the site should development proceed.

Prior to vegetation removal, much of the easement was comprised of riparian vegetation that provided a transitional zone between purely aquatic and purely upland habitats. Healthy riparian zones of proper width provide numerous functions, including protection and improvement of water quality through a buffering function, streambank protection,

Figure 5. Brushpiles were created in upland areas with slash resulting from the bushhogging operation conducted during December 1998.

provision of habitat for a wide array of plants and animals, movement corridors for migration and dispersal of wildlife, groundwater recharge, and floodwater attenuation (Mitsch and Gosselink 1986, Wilkinson et al. 1987, Taylor 1990, Fischer et al. 1999). Many riparian zones in North America, including the majority of riparian habitats historically found along the Detroit River, have been degraded or destroyed to the point that their ability to provide ecological functions has either been diminished or eliminated.

The establishment and maintenance of vegetated buffers, both in uplands and in wetlands, can be considered compensatory mitigation for losses of wetlands and waters of the U.S. authorized by CE permits as long as those conditions are related to activities regulated by CE (Federal Register, 1999). The Corps of Engineers can require vegetated upland buffers adjacent to open waters of the United States as part of a Clean Water Act Section 404 permit since these buffers provide many of same functions as wetland buffer strips (Federal Register, 1999).

There is increasing interest in managing buffer strips along watercourses for a variety of objectives. Potential problems associated with an inadequate buffer strip between the limits of development and aquatic habitats include:

a. A reduction in the ability of the buffer strip to protect wetland and aquatic systems from non-point sources of pollution (e.g., lawn fertilizers and pesticides) carried in both surface and subsurface flow during precipitation events.
b. Disturbance to aquatic avifauna (e.g., herons, egrets, waterfowl) by human activity and domestic animals (e.g., dogs, cats).
c. Loss of perching and nesting sites for other sensitive birds (e.g., bald eagles, osprey, black-crowned night-herons)
d. Loss of breeding and migratory stopover habitat for Neotropical migrant songbirds, many of which are declining in numbers.
e. Loss of habitat for a variety of terrestrial and wetland faunal species.
f. An increase in non-indigenous species within disturbed areas (e.g., Phragmites, purple loosestrife).
g. Proclivity of private landowners to "underbrush" riparian zones to have a better view and/or access to water.

RECOMMENDATIONS

1. ***We recommend buffer strips of at least 100-ft. (30 m) to adequately protect wetland and aquatic habitats from potential non-point source pollutants from upland developments.***

The width of the existing buffer strip (60 ft.) likely is inadequate to provide proper buffering function from upland development to protect water quality. However, we were not able to locate studies addressing buffer strips and water quality in the region. In Maine, Woodard and Rock (1995) suggested that a 15-m (49 ft.) hardwood buffer strip was effective in reducing phosphorus concentrations adjacent to single family houses, but suggested the buffer needs to remain undisturbed to function properly. Lynch et al (1995) recommended at least a 30-m (98 ft.) buffer between logging activity and wetlands/streams to remove at least 80% of suspended sediment in stormwater. Shisler et al. (1987) found that a 19-m (62 ft.) forested riparian buffer removed up to 80% of excess phosphorus and 89% of excess nitrogen from surface runoff. Wider buffer strips would be necessary to completely remove these pollutants.

2. ***We recommend buffer strips of at least 300 ft. for provision of suitable wildlife habitat and movement corridors.***

A 60-ft. buffer strip is not adequate for functions associated with wildlife populations in and adjacent to Humbug Marsh. Recent research has shown the importance of considering habitat needs of birds and other wildlife in riparian zones.

Bald Eagles and Osprey

Management of roost sites and feeding areas is critical for bald eagles and ospreys. Green (1985) recommended prohibiting or minimizing human activity within a 0.25-mile (400m) zone of night roosts and major feeding areas during the time of year that eagles are present; this could be reduced to 330 ft (101m) if vegetation adequately screens human activity. Other recommendations include maintaining roost trees and preferred hunting and loafing perches in feeding areas, prohibiting habitat alterations such as road construction, land clearing, and clear cutting in roosting and feeding areas, and protecting riparian zones (Green 1985). The U.S. Fish and Wildlife Service (1983) recommended a 400 m (1320 ft) buffer zone around eagle feeding areas, and stated that management of feeding areas should include provisions for (1) protection/retention of trees used as hunting and resting perches, and (2) protection of cover or physiographic features that buffer feeding areas from disturbance and the elements. Cline (1985) recommended that low wet areas, stream bottoms, swamps, marshes, and flooded beaver areas be left undisturbed and protected by a 300-ft (92 m) protection zone around the area. Land within 90 ft (28 m) of a shoreline should be protected from timber cuts of 1 acre (0.4 ha) or more. As many dead trees as possible should be left standing, and trees with a diameter of 12 in. (30.5 cm) or greater should be left as perch trees. Recreational boating should be kept to a minimum within 300 ft of the shore in areas identified as important feeding habitat (Cline 1985).

Other Avian Species

The suitability of a riparian zone to provide avian habitat varies depending on several factors, including width, length, degree of fragmentation, dominant vegetation, and number of vegetation layers. Unfortunately, avian habitat requirements are rarely included in the designation of riparian zone width in restoration and management plans. Throughout riparian areas of the United States, riparian zone width often is related positively to avian species richness both within and adjacent to riparian zones (Stauffer and Best 1980, Triquet et al. 1990, Keller et al. 1993, Kilgo et al. 1998).

Several recent studies in North America, mostly in the eastern U.S., have attempted to identify minimum widths of riparian zones necessary to sustain bird populations. These studies were summarized by Fischer (1999) (Table 1), and most recommended at least 100 m (328 ft.) of habitat adjacent to aquatic systems. Riparian habitats narrower than 300 ft. still provide habitat for birds, but the majority of species present will be forest-edge species. Few forest-interior species, or those requiring large contiguous blocks of forest habitat to maintain stable populations, occur in narrow strips of habitat (Robbins et al. 1989, Keller et al. 1993). Some studies have shown a corresponding decrease in the percentage of species present in riparian habitats with a corresponding decrease in buffer

Table 1. Recommended minimum widths of riparian buffer strips and corridors for birds (Fischer 1999).

Authors	Location	Minimum Width	Benefit
Darveau et al. 1995	Canada	>60m	There was evidence that 50-m-wide forested buffer strips were required for forest-dwelling birds. Bird populations may decline in strips before regeneration of adjacent clearcuts provides suitable habitat for forest birds.
Hodges and Krementz 1996	Georgia	>100m	Riparian strips >100m were sufficient to maintain functional assemblages of the six most common species of breeding Neotropical migratory birds.
Mitchell 1996	New Hampshire	>100m	Need >100m-wide buffers to provide sufficient breeding habitat for area sensitive forest birds and nesting sites for red-shouldered hawks.
Tassone 1981	Virginia	>50m	Many Neotropical migrants will not inhabit strips narrower than 50 m
Triquet et al. 1990	Kentucky	>100m	Neotropical migrants were more abundant in riparian corridors wider than 100 m; riparian areas <100 m wide were inhabited mainly by resident or short-distance migrants.
Spackman and Hughes (1995)	Vermont	>150m	Riparian buffer widths of at least 150m were necessary to include 90% of bird species along mid-order streams.
Kilgo et al. (1998)	South Carolina	>500m	Although narrow bottomland hardwood strips can support an abundant and diverse avifauna, buffer zones at least 500m wide are necessary to maintain the complete avian community.
Keller et al. 1993	Maryland; Delaware	>100m	Riparian forests should be at least 100m wide to provide some nesting habitat for area-sensitive species.
Gaines 1974	California	>100m	Provide riparian breeding habitat for California yellow-billed cuckoo populations.
Vander Haegen and deGraaf 1996	Maine	>150m	Managers should leave wide (>150m) buffer strips along riparian zones to reduce edge-related nest predation, especially in landscapes where buffer strips are important components of the existing mature forest.
Whitaker and Montevecchi 1999	Canada	>50m	50-m-wide riparian buffers only supported densities <50% of those observed in interior forest habitats.
Hagar 1999	Oregon	>40m	Although riparian buffers along headwater streams are not expected to support all bird species found in unlogged riparian areas, they are likely to provide the most benefit for forest-associated birds species if they are >40 m wide.

Figure 6. A few large trees remain in the riparian zone adjacent to Humbug Marsh but the value of the riparian zone for wildlife was diminished during bushhogging in 1998.

zone width. For example, Triquet et al. (1990) found that Neotropical migrants were more abundant in riparian corridors wider than 100 m; riparian areas <100 m wide were inhabited mainly by resident or short-distance migrants. Spackman and Hughes found that riparian zones 150m wide provided habitat for approximately 90% of bird species typically inhabiting riparian communities in Vermont. Riparian zones 175m wide provided habitat for 95% of species. Table 2 provides some general information on what would and would not be provided with a 30-m. (100 ft.) buffer strip.

There are other potential problems associated with narrow riparian zones. For example, Vander Haegen and DeGraaf (1996) investigated the relationship between riparian buffer zone width and the effects of predation on songbirds in Maine. They suggested that vegetated buffer strips at least 150m wide be maintained to reduce edge-related predation.

Disturbance to wildlife may reduce species diversity and density (Boyle and Samson 1985, Cole and Knight 1990) and affect wildlife community dynamics either directly (Knight and Skagen 1988, Cole and Knight 1990) or indirectly (Skagen et al. 1991, Pfister et al. 1992). As human disturbance increases, some species have difficulty locating adequate food supplies and resting sites (Skagen et al. 1991, Pfister et al. 1992). Several studies have recommended buffer strips ranging from 100m to 250m between disturbance and breeding wading birds (Vos et al. 1985, Erwin 1989, Rodgers and Smith 1995). Rodgers and Smith (1997) recommended a 100m buffer between disturbance and foraging/loafing waterbirds in Florida.

Table 2. Wildlife Habitat Within a 30-m (100 ft.) buffer (after Chase et al. 1995)

Species	What 30m (100ft.) provides	What 30 m (100 ft.) does not provide
Eastern newt (*Hemidactylium scatatum*)	Maintain water quality of wetlands and surface waters	Habitat for terrestrial juveniles (efts) – travel for 2-7 year olds
Green frog (*Rana clamitans melanota*)	Usually stay within 20m (65 ft) of water	Dispersal habitat
Wood frog (*Rana sylvatica*)	Breeding habitat, if buffer habitat protects ephemeral woodland pools	Habitat for most terrestrial activity, often well away from water
Spotted turtle (*Clemmys guttata*)	Shading, large organic debris, streambank stability, protective cover, invertebrate and small vertebrate prey, winter hibernating habitat	Habitat for most terrestrial activity—will travel up to 800 m (>2600 ft) from water to find temporary food sources
Northern water snake (*Nerodia sipedon sipedon*)	Habitat for most aquatic activities	Habitat for dispersal and hibernation
Eastern ribbon snake (*Thamnophis sauritis sauritis*)	Foraging habitat	May travel several hundred meters from water to mate; hibernate in upland areas
Bald Eagle (*Haliaeetus leucocephalus*)	Foraging, perching and roosting sites	Nest sites—most eagle nests are within 395m (1300 ft) of shorelines; protection from human disturbance
Red-shouldered hawk (*Buteo lineatus*)	Foraging habitat	Nesting sites—this species is found only where buffers are 100m (330 ft.) or more
Area sensitive forest birds	Some foraging and nesting habitat; problems characteristic of edge habitat (increased predation and nest parasitism)	Sufficient breeding habitat for species that need buffers wider than 100m (330 ft.).

3. ***We recommend that impacts of the clearing operation conducted in the conservation easement be offset by rehabilitating the existing easement area with plantings of preferred wildlife trees (e.g., oaks, hickories) and shrubs, and by extending the width of the buffer strip to reclaim habitat lost by the clearing operation.***

Although the area has quickly revegetated with grasses, vines, and herbaceous plants and presently provides food and cover for some wildlife species, the overall quality and habitat diversity has deteriorated due to the clearing operation.

The WES Team bases the aforementioned recommendations on one site visit during 3 August 1999; resources provided to us by the U.S. Army Engineer District, Detroit; peer-reviewed and other literature; and best professional judgement.

Bird Species Observed During Site-assessment during 3 August 1999 by the WES Team.			
Humbug Island		***Mainland***	
Forster's Tern	Tree Swallow	Common Yellowthroat	Black-capped Chickadee
Caspian Tern	Eastern Wood Pewee	N. Rough-winged Swallow	Blue Jay
Great Blue Heron	Mallard	Eastern Kingbird	American Goldfinch
Ring-billed Gull	Great Egret	Indigo Bunting	Cedar Waxwing
Common Grackle	Wood Duck	Red-winged Blackbird	Barn Swallow
Canada Goose	Barn Swallow	House Wren	Cooper's Hawk
Black-crowned Night Heron	Northern Cardinal	Northern Cardinal	European Starling
Blue Jay	Black-capped Chickadee	Mourning Dove	Hairy Woodpecker
			Black-crowned Night-Heron

Note: This list is not necessarily representative of the breeding bird community because most birds had completed breeding and nesting and were not vocalizing during the visit. Also, it was a very cursory observation of birds during the middle of the day when many birds are inactive.

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